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ABSTRACT

"IMPROVEMENTS IN AND RELATING TO LOCKS"

A key for a pin-tumbler lock. The key has a head portion  
5 (11) and a bow (12) with a plurality of pin notches (13).  
One key notch (13') has an abutment surface (14) configured  
such that an axial removal force applied to the key when in a  
lock cylinder does not apply a radial disengagement of an  
engaged lock pin (16) thus the key is prevented from being  
10 removed from the lock cylinder. The key includes a narrow  
groove (17) to receive a key release element (18). This key  
release element has a distal end (19) shaped to engage with  
the pin (16) in the pin notch (13') to cause radial  
displacement of the pin and thereby enable the key to be  
15 released from the lock cylinder (C).

(Figure 2)

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**COMPLETE SPECIFICATION**

**FOR A STANDARD PATENT**

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Invention Title:	Improvements In and Relating to Locks

The following statement is a full description of this invention, including the best method of performing it known to me/us:-

This invention relates to improvements in locks and more particularly to a key for a keyed pin-tumbler type lock.

For security reasons it is known to incorporate in a door an interior lock-set whereby the door can be locked from within the building. Generally the key will be left within the lock so as to enable persons within the building to operate the lock to thereby exit through the door. However, when the building is left unattended or persons within the building are not within close proximity to the door and therefore may not detect forced access through or adjacent the door in order to operate the internal lock set, it is common for the key to be removed. This, however, creates a potentially undesirable situation where the key may not be present in the lock yet a person within the building needs to exit through the door. Such a situation can, for example, arise in an emergency situation where say the building is on fire or in a panic situation where say intruder has gained access to the building and the occupant needs to quickly unlock and exit through the door.

A further situation where the key may not be present in the lock and therefore not available in an emergency or panic situation or indeed during normal usage is where the key has been removed and then misplaced. Such removal could, for example, occur with a child playing with the key.

The object of the present invention is to provide a key for a pin-tumbler type lock whereby the key once installed in the lock is unable to be removed except with the use of a separate key release element.

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According to one broad aspect of the invention there is provided a key for a pin-tumbler lock the key having a head portion and a bow, said bow having a plurality of pin notches such that when the key is inserted in a pin-tumbler type lock  
10 the pin notches position a series of pins within the lock to permit rotation of a lock cylinder of the lock within a lock body, the key being characterised by one pin notch having an abutment surface configured such that an axial removal force applied to the key when in the lock cylinder does not apply a  
15 radial disengagement of the engaged lock pin in said one pin notch thereby preventing the key from being removed from the lock cylinder, the key including a narrow, relative to the height of the bow, groove extending along the head and at least part of the bow to receive an elongate key release  
20 element said key release element being engageable in the groove and having a distal end shaped to engage with the pin in said one pin notch to cause radial displacement of said pin and thereby enable the key to be released from the lock cylinder.

25

When a key is used in an internal lock-set in the aforementioned manner the head of the key becomes a vital

part of the operation of the door. The conventional head of a key is not particularly suited for such continual usage because amongst other things it does not provide a comfortable or sufficiently large gripping area and the  
5 operating leverage can be high. Thus according to one embodiment of the present invention the head of the key is provided in the form of a thumb turn.

In the following more detailed description of the invention  
10 reference will be made to preferred embodiments and reference will be made to the accompanying drawings in which:-

Figure 1 is a perspective view of a pin-tumbler type key lock with a key of the present invention inserted therein,  
15

Figure 2 is a cross-sectional illustration of the pin-tumbler type lock with the key inserted and in juxtaposition the key release element, and  
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Figure 3 is a similar view showing an embodiment of the invention as part of a twin lock-set for internal and external locking of a door.

25 According to the present invention the pin-tumbler lock is of a conventional construction. Thus there is provided a lock cylinder C rotatably mounted within a lock body B and having

a slot into which the bow of a key can be slid. Located within the lock cylinder are a plurality of lock pins P and similarly a corresponding plurality of lock pins P' with biasing means (eg. springs) are located within the lock body B. Thus upon the key 10 being slid into the lock cylinder C the pin notches in the key are, when the key 10 is fully installed, engaged by lock pins P of the lock cylinder in a manner that the respective sets of lock pins P and P' are positioned with a part line thereof between the respective sets of pins so that the lock cylinder C may be rotated relative to the lock body B.

The key 10 according to the present invention is provided by a head 11 which in the more preferred form of the invention is in the form of a thumb turn. The dimensions and configuration of the thumb turn 11 is, as shown, considerably different to the normal head of a standard key thereby making it easier for a user to grip and rotate the key.

The bow 12 of the key 10 has according to conventional construction a plurality of lock pin notches 13. One of these notches 13' (preferably the third or greater notch away from the head 11) is formed with an abutment surface 14. This abutment surface 14 is in the preferred form a vertical face. According to the preferred form of the invention notch 13' having the abutment face 14 is a number three cut or greater ie. is a deep notch. This ensures a good degree of

contact between the abutment surface 14 and the lock pin 16 which engages in notch 13'.

If any axial force is applied to the key 10 in an effort to remove the key from the lock cylinder the interaction of the vertical abutment face 14 with the lock pin 16 does not result in the lock pin moving radially as would be the case with a conventional profiled key notch. Therefore the key is prevented from removal from the lock cylinder C.

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A narrow slot 17 (the slot being narrow relative to the height of the bow 12) is formed longitudinally through the head 11 and along all of the length of the bow 12 or at least to or preferably just beyond notch 13'. This slot 17 is formed preferably in the thickest part of the key and is so positioned that the "bow" 19a of an elongate key release element 18 (see Figure 2) when slid along the groove 17 can have the distal end 19 thereof engage with lock pin 16. The distal end 19 of the key release element 18 is formed with a ramp or sloped end so that when it contacts pin 16 the pin is pushed out of the notch.

Thus when the "bow" 19a of the key release element 18 is fully installed (slid) along groove 17 in the key 10 an axial removal force can be applied to both the key 10 and key release element 18 (the inter-engagement of the distal end 19 with the "bow" 19a having caused the lock pin 16 to move



radially until it is clear of the top of the abutment surface 14). Because pin 16 no longer abuts with abutment surface 14 the key 10 and release key element 18 in combination can be removed from the lock cylinder C.

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By using a thin groove or slot 17 extending along the length or at least part of the length of the bow 12 and positioned at the thickest cross-section of the bow the integrity and strength of the key is not impaired by the presence of the  
10 groove 17.

In a twin lock-set arrangement (see Figure 3) where the door has an internal lock L and an external lock L' both of which are identically keyed a security problem can arise. For  
15 example if the internal key 10 when removed from the lock falls into the possession of someone not having authority to gain access to the building the key could be used to operate the external cylinder. According to a form of the present invention, however, the internal key 10 can be provided with  
20 one of the notches 13a being shallower than the corresponding notch 13b in the external key 10'. To enable a split line to be formed when the key 10 is inserted into the internal lock cylinder L an additional pin or chip 20 is provided in the inner lock cylinder C. The length of the chip 20 is  
25 equivalent to the difference in the depth between the notches 13a and 13b of the internal key 10 and the external key 10'.

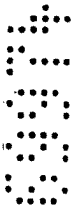
Thus when the internal key 10 is placed in the internal lock cylinder C the shallower notch 13a causes the chip 20 to move into the cylinder body B to allow the part line to be formed. However, when the external key 10' is inserted into the internal lock cylinder C the chip 20 remains within the lock cylinder C to thereby form the part line.

In the event that the internal key 10 is inserted into the external lock cylinder C' the shallower notch 13a will cause the corresponding pin Pa in the lock cylinder C' to move such as to project beyond the lock cylinder and into the lock body B thereby preventing a split line from being formed. Consequently the internal key 10 cannot be used to unlock the external lock L'.

The invention is open to modification but within the scope of the following claims as will be appreciated by those skilled in the art. For example, a plurality of key notches can be provided with abutment faces 14. In fact, all of the notches on the bow 12 can be provided with abutment faces 14 provided the length of the "bow" 19a of the key release element is sufficient to release the pin P engaged in the notch with abutment face 14 which is furthest from head 11.

Therefore according to the present invention a special key can be used to operate a conventionally keyed pin-tumbler lock. However, once inserted the key while being able to

move the lock cylinder between it's locked and unlocked positions is not able to be withdrawn from the lock cylinder. However, by inserting the key release element the pin preventing the key from being removed is moved clear of the  
5 abutment formed in the key to thereby permit the key and the release key to be simultaneously removed from the lock.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A key for a pin-tumbler lock, the key having a head portion and bow, said bow having a plurality of pin notches  
5 such that when the key is inserted in a pin tumbler type lock the pin notches position a series of pins within the lock to permit rotation of the lock cylinder of the lock within a lock body, the key being characterised by one pin notch having an abutment surface configured such that an axial  
10 removal force applied to the key when in the lock cylinder does not apply a radial disengagement of the engaged lock pin in said one pin notch thereby preventing the key from being removed from the lock cylinder, the key including a narrow, relative to the height of the bow, groove extending along the  
15 head and at least part of the bow to receive an elongate key release element, said key release element being engageable in the groove and having a distal end shaped to engage with the pin in said one pin notch to cause radial displacement of said pin and thereby enable the key to be released from the  
20 lock cylinder.

2. A key as claimed in claim 1 wherein the head is in the form of a thumb turn.

25 3. A key as claimed in claim 1 or 2 wherein the abutment surface is substantially perpendicular to a longitudinal axis of the bow.



4. A key as claimed in claim 3 wherein the distal end of the key release element is shaped to form a ramp.
- 5 5. A key as claimed in any one of the preceding claims wherein the said one pin notch is located adjacent the transition of the head and the bow.
6. A key as claimed in any one of claims 1 to 4 wherein  
10 normal pin notches are located to either side of said one pin notch.
7. A key as claimed in claim 6 wherein said one pin notch is the third or greater notch away from the head.
- 15 8. A key as claimed in claim 7 is a deep notch.
9. A key as claimed in claim 8 wherein the said one pin notch is a number 3 cut or greater.
- 20 10. A key as claimed in any one of the preceding claims wherein the groove is formed in the thickest cross-section of the bow.
- 25 11. A key as claimed in any one of the preceding claims wherein a plurality of the key notches is provided with an abutment surface.

12. A key for an internal pin-tumbler lock-set substantially as herein described with reference to the accompanying drawings.

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13. A twin pin-tumbler lock-set including an internal lock and an external lock and including a key according to any one of the preceding claims, the internal lock having an additional pin or chip associated with one of the pins, the  
10 length of the chip or additional pin being equivalent to the difference in the depth between corresponding notches of said key and a key for operating the external lock.

14. A twin pin-tumbler lock-set substantially as herein  
15 described in combination with a key as claimed in claim 1 and as illustrated in Figure 3 of the accompanying drawings.

DATED this FOURTH day of MAY 1998  
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FIG. 2.

US 66 00074

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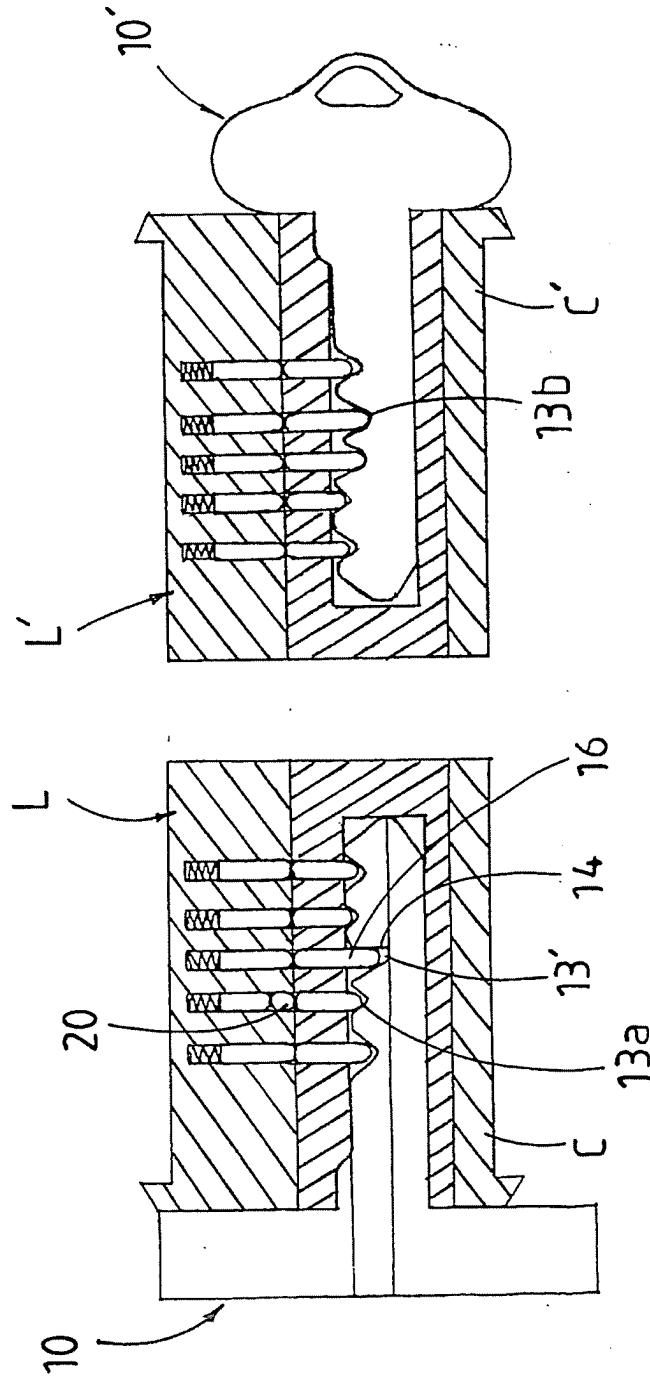


FIG. 3.